NORTH DAKOTA GAME AND FISH DEPARTMENT

Final Report

Distribution of grassland insects in Eastern North Dakota

Project T-33-R-1

April, 1 2011 – March 31, 2013

Terry Steinwand
Director

Submitted by Greg Link
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Bismarck, ND

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Project Title: Distribution of grassland insects in Eastern North Dakota

Species of Conservation Priority: Terrestrial insects.

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Anticipated Activity Period: April 1, 2011 – March 31, 2013

Location: Focus on grassland habitats of eastern North Dakota.

Need: One of the 2010 funding priorities is to support the development of background information on invertebrates in North Dakota to allow for the inclusion of invertebrates in upcoming revisions of the Wildlife Action plan. This project will help provide historical and current distribution and abundance information on grassland insects.

Objectives:

1. Compile presence/absence and locality data from museum collections.
2. Literature review to collate currently published species lists and distribution data for insects in North Dakota.
3. Field surveys of current grassland habitat to provide a good baseline of current distribution data for grassland insects in the eastern portion of North Dakota.
4. Amalgamation of data from the first three steps into checklists and range and distribution maps for insect species of particular interest.

Expected Results or Benefits: The project would provide a good baseline of data on grassland insects in Eastern North Dakota. This information will be highly important for proposed revisions to the Wildlife Action Plan to include invertebrates.

Approach:

Note: Due to health issues of the graduate student in charge and the project obtaining more samples then had been anticipated additional work for Objectives 1,3, and 4 will need to be completed to fully satisfy the objective. It is anticipated that all work will be completed with a 6 week time period.

Objective 1: Museum collections represent a relatively untapped source of information on species distributions (Ponder *et al.*, 2001). For this objective, we have focused on compiling the information available in the UND invertebrate museum collection which has specimens dating back to the 1920s. We have searched through the Diptera, Lepidoptera, Hemiptera, Coleoptera and Hymenoptera in the UND collection and to date have found just over 4000 individual specimens that met our criteria of being >5 mm in length and from ND. Specifics about those

specimens have been entered into an electronic database, including order, family, species if recorded (many specimens still need to be IDed), collection locality, and date of collection. There are still a number of major orders of insects in the museum that need to be cataloged including the Homoptera, Odonata and Orthoptera. We expect to complete this work in the next 6 weeks.

Objective 2: Another source of distribution information on insects are published species and group descriptions. For example, books like Butterflies of North Dakota (Royer, 1988) or species descriptions (McCabe, 1981) often provide information on insect species distributions. We searched for literature on insects of North Dakota using SCOPUS, a web-based publication index available through the library at UND. We had little success finding useable publications, likely due to the limited research on insects in ND. We found 8 sources (Hanley 2005, Helgesen 1967, Lago et al. 1979, McCabe 1977, McCabe 1981, Puckering and Post 1960, Royer 1988, Royer 2003). These publications resulted in 2000 records (where each record is a county incidence of a particular species). As with the museum collection data information on order, family, species, collection locality, and date of collection or publication if collection date is not provided were recorded in the electronic database.

Objective 3: To provide current distribution information on grassland insects, insect were sampled from grasslands under state control. In the summer of 2011 insects were sampled from 19 locations and in the summer of 2012 another 18 sites were sampled (Fig. 1, Table 1). The sites have been chosen to provide broad coverage of the eastern half of the state.

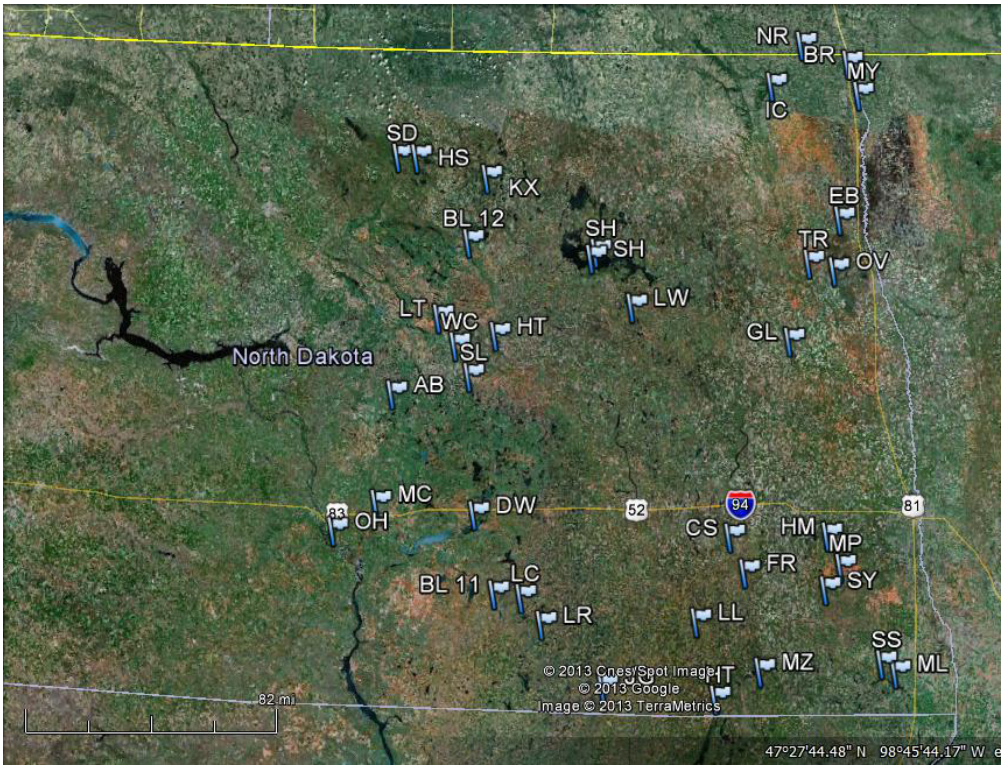

Figure 1: Map of North Dakota, showing sampled sites from 2011 and 2012. Site codes can be found in Table 1.

Table 1: Site information for the insect sampling. *Refers to sites that were only sampled once.

Abbreviations	Site Name	County	Directions	UTM Locations
TR	Turtle River State Park	Grand Forks	22 miles W of Grand Forks, Hwy 2	5311494
GL	Golden Lake	Steele	9.5 miles E, and 2 miles N of Finley	5271261
OV	Oakville Prairie	Grand Forks	3 miles E, and 2 miles S of Emerado	5307885
***LC**	Logan County	Logan	5 miles N, 5 miles W, and 1 mile N of Lehr	5138034
WC	Wells County	Wells	14 miles S of Harvey	5266429
LR	Lehr WMA	McIntosh	2 miles E, and 1 mile S of Lehr	5124459
BL 11	Beaver Lake State Park	Logan	17 miles SE of Napoleon	5139780
NR	D.L. Thompson	Pembina	1 mile S, 1 mile E, and 0.5 mile N of Neche	5424840
BR	Baron	Pembina	1 mile E of I-29 and Exit 208	5415451
HT	Hooreart	Wells	3 miles S, 1 mile W, and 0.5 mile S of Fessenden	5271896
***LT**	Lone Tree	Wells	6 miles S, and 2 miles W of Harvey	5280628
SL	Silver Lake	Wells	5 miles E, and 2 miles S of Hurdsfield	5250671
***AB**	Art Braza	Burleigh	4.5 miles S, 1 mile E, 6 miles S, 3.5 miles E of McClusky	5241142
LL	Cottonwood Creek WMA	Lamoure	3 miles S of Lamoure	5127069
CS	Clausen Springs	Barnes	3 miles N, and 1 mile E of Jct. ND 1 and ND 46	5170533

FR	Fort Ransom WMA	Ransom	1 mile SW of Fort Ransom	5152484
SH	Sully's Hill	Benson	6 miles N of Fort Totten	5312330/5315440
***LW**	Lake Washington	Eddy	6 miles S of Warwick	5287495
***EB**	Ed Bry	Grand Forks	7 miles W, and 5 miles N of Manvel	5334244
OH	Oahe WMA	Emmons	Along the Missouri River, 17 miles S of Bismarck	5170673
DW	Dawson WMA	Kidder	6 miles S of Dawson	5180045
MC	McKenzie Slough WMA	Burleigh	0.5 miles S of McKenzie of I-94, Exit 176	5185020
MZ	Meszaros Slough WMA	Sargent	3.5 miles S, and 3.5 miles W of Cogswell	5101997
HT	Hyatt Slough	Dickey	1 mile W, and 4 miles S of Ludden	5087575
JG	Johnsons Gulch	Dickey	16 miles W, 3 miles S, and 1 mile W of Ellendale	5093534
SS	Stack Slough	Richland	2 miles N, and 6 miles W of Hankinson	5106648
ML	Mud Lake	Richland	2 miles SW of Hankinson	5101970
MP	Mirror Pool	Richland/Ransom	8 miles E, 4.5 miles S, and 2 miles E of Sheldon	5155746
HM	Hamilton Wells	Cass	13 miles S, and 1.5 miles E of I-94, Exit 320	5171898
SD	Sand Hills	McHenry	3.6 miles N, and 1 mile E of Towner	5363426

HS	Horseshoe Lake	Pierce	8.5 miles W, 4 miles N, and 1 mile W of Rugby	5363186
KX	Knox Slough	Benson	1 mile W of Knox	5352948
BL 12	Buffalo Lake	Pierce	5 miles W of Esmond	5319613
IC	Icelandic State Park	Cavalier	5 miles W of Cavalier, Hwy 5	5403070
MY	Billings WMA	Pembina	2 miles E, 2 miles S, and 1 mile E of I-29 and Exit 200	5399188
SY	Sheyenne Grasslands	Ransom	15 miles E of Lisbon	5144250

Most grassland sites were sampled twice between mid-June and early-September though a few could only be sampled once due to access issues due to flooding (Table 1). The amount of 6 different sub-habitats based on herbaceous vegetation assemblages within each prairie patch (native tallgrass prairie, rocky mixed prairie, wet ravine vegetation, restored prairie, weedy, and smooth brome; USGS, 2011) was assessed and each sub-habitat was sampled proportionally. Sampling locations were recorded using a GPS. A number of methods were used to sample insects:

- Pitfall traps: Traps set in the ground to capture terrestrial invertebrates. Pitfall traps were laid out along fixed transects (5 traps per transect, 2 transects per sampling period), deployed for 2 days, and then the captured insects returned to the lab for sorting, identifying and counting.
- Malaise traps: Tent-like traps which intercept and capture flying insects. Two traps set out at each grassland site for each sampling period. Traps were active for 2 days and then captured insects returned to the lab for processing.
- Sweep net sampling: Hand-held net used to capture insects on vegetation. Five 5-meter transects were walked per site per sampling period sweeping the top of the vegetation. Captured insects were returned to the lab for processing.
- Visual identifications: A half hour Pollard walk was conducted at each site during each sampling period to identify Lepidoptera (butterflies and moths) and Odonata (dragonflies and damselflies) on the wing or at rest. If a specimen could not be identified on the wing it was captured with a butterfly net and identified at close range and then released.

All samples were labeled and stored on ice, until they were transported to the lab for processing. The sampled insects were pinned, examined and counted. Individuals were initially identified to a morphospecies based on morphological characteristics. Voucher specimens for all morphospecies have been deposited in the UND invertebrate museum. Representatives from the morphospecies are then identified to taxonomic species, if possible. We took this approach to

allow for the processing of the large amount of insect material collected. All samples collected in 2011 have been pinned and identified to morphospecies. Most of the samples collected in 2012 have been pinned and identified to morphospeces with the exception of 10 sampling events (i.e., site-date combinations). We expect to be done processing all samples to morphospecies in the next 6 weeks. Identifying morphospecies to taxonomic species has been done for some of the easily identifiable species but remains to be done for many of the morphospecies.

To date 7,880 individuals have been examined resulting in 761 morphospecies. Those morphospecies are distributed across 8 orders are well represented in the samples (Figure 2). Families within the orders are also very diverse, as shown below with a break-down of the largest orders found within the samples (Table 2).

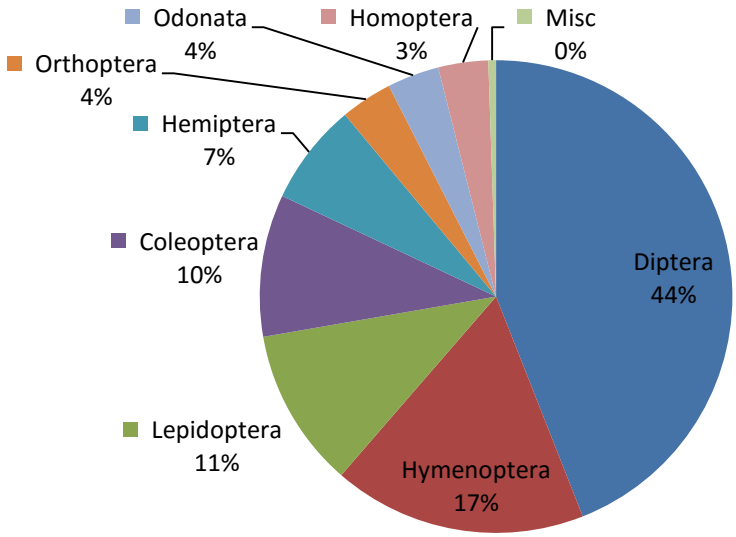

Figure 2: Distribution of the 761 morphospecies found to date in the field collected samples across insect orders.

Table 2. Major families represented in the four largest orders found in collection including the number of morphospecies within each family.

Diptera	#	Hymenoptera	#	Lepidoptera	#	Coleoptera	#
Muscidae	62	Ichneumonidae	53	Noctuidae	45	Carabidae	16
Tachenidae	64	Apidae	20	Micro-Leps	22	Lampyridae	10
Sarcophagidae	40	Formicidae	12	Hesperia	2	Coccinellidae	10
Calliphoridae	20	Pompillidae	12	Pieridae	2	Silphidae	4
Syrphidae	31	Vespidae	9	Misc. Families	11	Chrysomelidae	4
Chironomidae	19	Sphecidae	8			Misc. Families	30
Tipulidae	14	Misc. Families	18				
Culicidae	9						

Objective 4: Finally, the survey data from objective 3 and the historical data from objectives 1 and 2 will be combined and used to produce checklists and occupancy maps. We have produced occupancy maps for a number of species of conservation interest based on the data on hand, which are presented below. We expect to create the occupancy maps quickly after the data are finished being compiled.

American Burying beetle

The American Burying beetle (*Nicrophorus americanus*) is listed as an endangered species (FWS). Historical records show that this beetle was once widespread in North America occurring in 35 states, the District of Columbia, and three Canadian provinces. Currently natural populations are known to occur in only six states: Rhode Island, Oklahoma, Arkansas, Nebraska, Kansas and South Dakota (Ratcliff, 1997). The historical records offer little insight into what type of habitat was preferred by the beetle because of the widespread range. Current information suggests that this species is a habitat generalist, with a slight preference for grasslands and open understory oak hickory forests (FWS).

We have not found an American burying beetle in our collected samples nor in the UND invertebrate museum. We have identified four different carrion beetles in our collected samples, of those four, the burying beetle (*Nicrophorus marginatus*) is similar in size, presence of colored patches, and presence of colored, clubbed antennae to the American burying beetle. The burying beetle however does not have the red pronotum that is indicative of the American burying beetle, but could be easily mistaken for the American burying beetle.

Belfragii's Chlorochroan bug

Belfragii's Chlorochroan bug (*Chlorochroa belfragii*) is listed as a species of management concern (FWS). Historical records on the range of Belfragii's Chlorochroan bug are sparse; it has been collected in 4 states (Nebraska, South Dakota, Illinois, and North Dakota) and Canada (Manitoba). The most recent collections in North Dakota were in 1988 and 1972. Currently, little is known about the present status of the Belfragii's Chlorochroan bug. The bug appears to be associated with native wet prairie habitats and seems restricted to riparian habitats (USGS).

We have found the Belfragii's Chlorochroan bug at one site in 2011 [Cottonwood Creek WMA/ 9-3-2011/Lamoure County]. This species is also present in the UND invertebrate museum with these occurrences reported by Rider (2013). Because of this, the literature and museum samples are one in the same. We have added one new county record for this species (Figure 3).

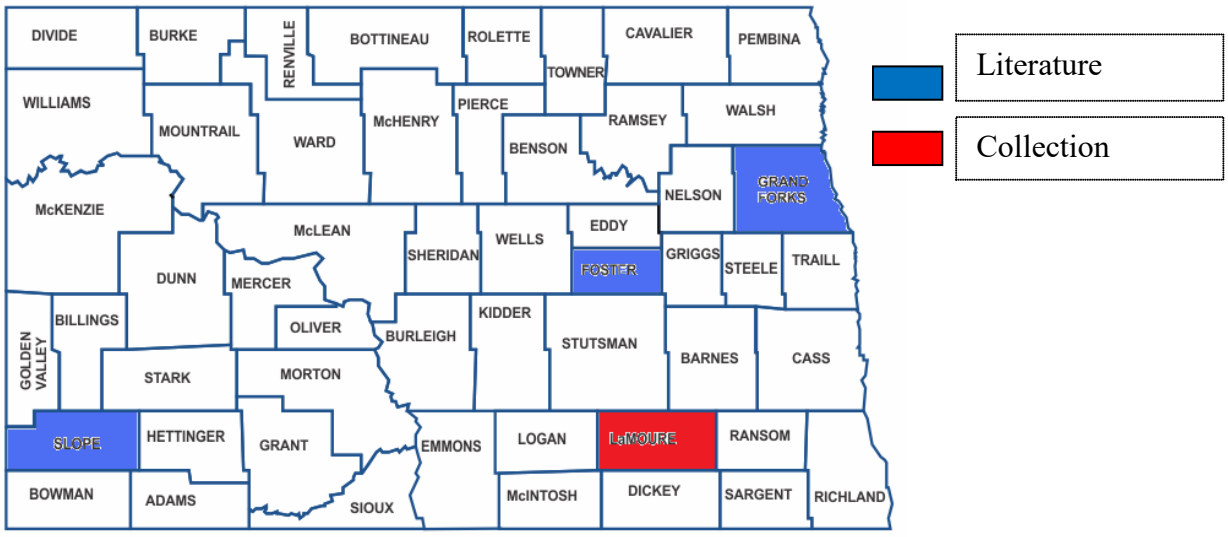

Figure 3: The distribution of Belfragii's Chlorochroan bug (*Chlorochroa belfragii*) in North Dakotan counties. Source of data indicated by the color fill.

Dakota Skipper

The Dakota skipper (*Herperia dacotae*) is listed as a candidate species, which means that the U.S. Fish and Wildlife Service has sufficient information to list it as threatened or endangered. The historical range of the Dakota skipper is not precisely known because of extensive destruction of native prairie preceded biological surveys in central North America. Currently, the species is known only to occur in scattered remnants of high-quality native prairie. The most significant remaining populations occur in Minnesota, South Dakota, North Dakota, and Manitoba (FWS, 1011).

The Dakota Skipper is extremely hard to identify on the wing due to rapid flight and the presence of a number of similar skippers. We observed many orange colored skippers on the wing during the butterfly observations but could not capture any for a positive identification.

Due to this uncertainty we are not using the butterfly observations in making the map. Skippers have been studied in North Dakota by R. Royer (MSU) and his published work "The Butterflies of North Dakota" provides distribution data on Dakota Skippers in North Dakota. Dakota skippers in the UND invertebrate museum were from Grand Forks and LaMoure counties. While we did not seek to capture Dakota skippers and did not expect malaise traps to intercept skippers we did find two individuals in our malaise collections adding Pembina [D.L. Thompson/ 6-26-11/ Pembina County] and Wells [Hooreart/ 8-16-11/Wells County] counties as new state records (Figure 4).

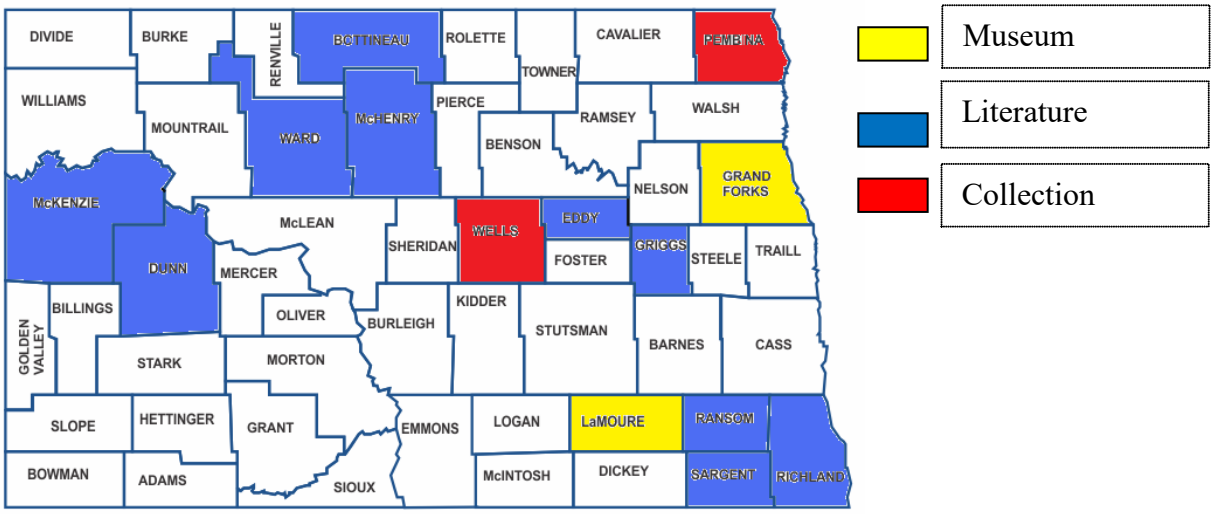

Figure 4: The distribution of Dakota skipper (*Herperia dacotae*) in North Dakotan counties. Source of data indicated by the color fill.

Regal Fritillary

The Regal Fritillary (*Speyeria idalia*) is listed as a candidate species (FWS). The historical range of the Regal Fritillary was from the central east coast, west to Montana and Colorado, and south to Oklahoma. Currently the range of this species is restricted in North Dakota and is commonly found in the Sheyenne National Grasslands in southeastern North Dakota. The regal fritillary is always associated with open grass-like areas; it is most commonly found in tall grass prairie, damp meadows and marshy areas (USGS).

A number of county locations were found in the literature. No specimens were found in the UND invertebrate museum. A regal fritillary specimen was collected in Logan county [Beaver Lake State Park/ 8-4-11/ Logan County] and anoth er regal fritillary was observed on the wing in Pembina county [D.L. Thompson WMA/ 8-26-2011/ Pembina County] (Figure 5).

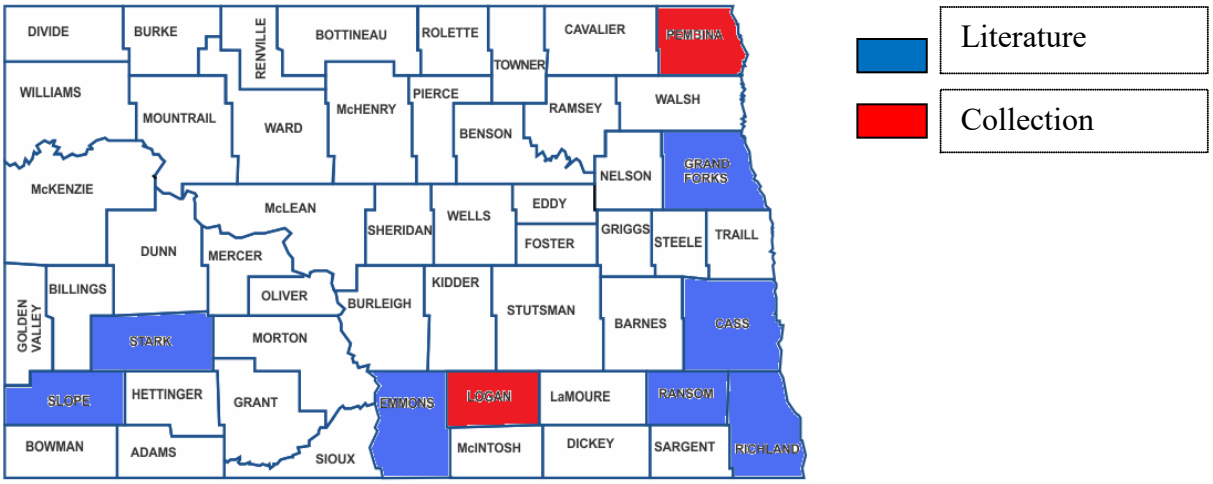

Figure 5: The distribution of Regal Fritillary (*Speyeria idalia*) in North Dakotan counties. Source of data indicated by the color fill.

Tawny Crescent (Phyciodes batesii)

We collected 2 Twany Crescent butterflies (*Phyciodes batesii*) one of which was in a county that already had a record in the literature (Figure 6).

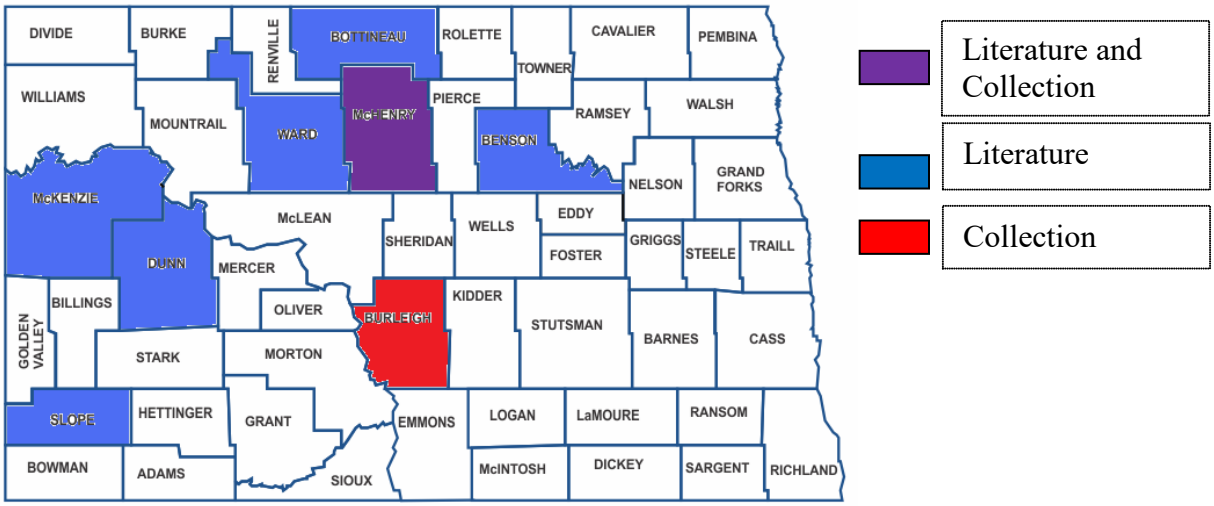

Figure 5: The distribution of the Twany Crescent (*Phyciodes batesii*) in North Dakotan counties. Source of data indicated by the color fill.

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